

TOPAZ CRYSTALS IN THE MINERAL COLLECTION OF THE U. S. NATIONAL MUSEUM.

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The U. S. National Museum collection of minerals contains many excellent crystals of topaz, representing most of the localities from which this mineral has been obtained in crystal form. A large number of the best ones were a part of the Leidy collection, while the balance have been acquired through individual gifts or from dealers.

Topaz has been such a very attractive mineral to investigators, owing to its rich variety of forms, its varying axial ratios, and its physical and optical characteristics, that very little that is wholly new can be added to our seemingly complete knowledge of the mineral, consequently the present article, while adding a little to the crystallography of the mineral from some of the localities, is mainly a description of the collection.

A wide range naturally exists in the perfectness of development of the crystals, but the majority of them have good bright faces and are easily measurable. The Russian crystals are superior to the others in size, beauty, and perfectness.

Many of the crystals have well-defined natural etch figures, especially on the prismatic and brachydome faces, and a few possess "Prärosion" faces.

ALABASHKA.

A larger part of the Russian crystals are credited to Alabashka. They are mounted either as single crystals or shown as group specimens, associated with quartz, feldspar, and mica. They are short, prismatic, with but one termination, and vary in macrodiagonal width from 2 to 5 cm. Owing to the predominance of the brachyprism they have a tetragonal appearance, with the prismatic faces usually striated. The characteristic color is pale blue or green, and a few have a beautiful aquamarine shade.

Two general types of the Alabashka crystals have been described by Koksharov¹; a simple and more frequently occurring type, consisting

¹Min. Russ., 1854, II, p. 198.

essentially of the three predominating forms $\{120\}$, $\{001\}$, and $\{041\}$ in combination alone, or with narrow faces of some of the other common forms; a rarer and more complex type, in which the unit prism $\{110\}$ has a greater development than the prism $\{120\}$, and whose combinations are much richer in the variety of forms. This second type is not well represented in the lot, as it is seldom that the unit prism is as large as the other prism $\{120\}$, besides the combinations are all quite simple.

While the general habit is the same for all these crystals, the combinations are quite varied. Fig. 1 represents the simplest and most common type of the crystals. The prism l $\{120\}$, base c $\{001\}$, and dome y $\{041\}$ are largely developed, while the prism m $\{110\}$ and pyramid i $\{223\}$ are shown more as beveling planes. Usually one face of y is much larger than the other, and occasionally u $\{111\}$ is also present. (No. 81247, U.S.N.M.)

On a crystal (fig. 2) there are, besides the forms l , c , y , m , and i , cited above, two additional pyramids, u $\{111\}$ and o $\{221\}$, and the dome f $\{021\}$. The form o is not prominent on any of the crystals, nor does it appear of frequent occurrence. The brachydome f is rare and its faces usually narrow.

The drawing (fig. 3) represents the general appearance of a crystal. In addition to the forms l , c , y , m , i , and u , the very narrow macrodome h $\{023\}$ truncates the edges of i , and the brachypinacoid b $\{010\}$ is present. These last two forms are of very rare occurrence on the Alabashka crystals. (No. 81244, U.S.N.M.)

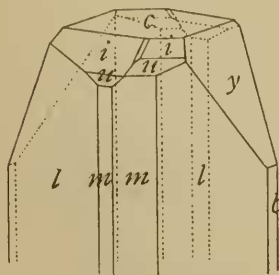


FIG. 1.—TOPAZ CRYSTAL FROM ALABASHKA.

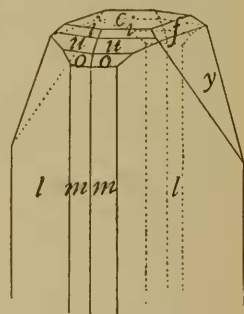


FIG. 2.—TOPAZ CRYSTAL FROM ALABASHKA.

ILMEN MOUNTAINS.

Crystals of topaz from the Miask district are noted for their great variety of combinations and many rare forms, and those of the collection, although lacking many of these rarer forms, yet have much richer and noticeably different combinations from those of the Alabashka crystals. From these latter they have several distinctive characteristics; they are mostly colorless, the base is generally small and sometimes absent, the two brachydomes f $\{021\}$ and h $\{023\}$ are common and the faces of the unit prism m are often broader than those of l .

Fig. 4 is a simple combination and seems to belong to the Adun Chalon type of crystal. No base is present and the brachydome *f* is proportionately large. Also, the faces of *l* are broader than those of *m*. The two remaining forms, *u* and *y*, are poorly developed. (No. 81255, U.S.N.M.)

Fig. 5 represents a more general type of these crystals, having the characteristic pyramid *x* {243} and the additional prism *g* {130} present as narrow faces. (No. 81253, U.S.N.M.)

One crystal (fig. 6) is marked by the presence of the brachydome *X* {023} and the macrodome *d* {201}, two forms which are especially characteristic of the Ilmen Mountain crystals. A rounded face of *q* {423} and of *h* {203} is also present. On the crystal represented by the drawing the base is broader than common, making *X* consequently narrow. (No. 81254, U.S.N.M.)

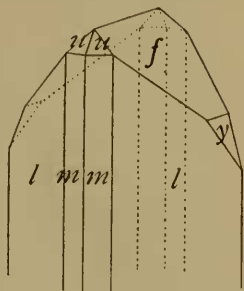


FIG. 4.—TOPAZ CRYSTAL FROM ILMEN MOUNTAINS.

NERCHINSK DISTRICT.

The crystals from this district are credited to the Adun Chalon Mountains and to the Urulga River. Those from the first-named locality are simple in character, and their type is shown in fig. 4. The collection embraces a few single crystals and some large groups.

Those from the region about the Urulga River are fine, clear, colorless crystals, varying in width from 1 to 4 cm., and quite sym-

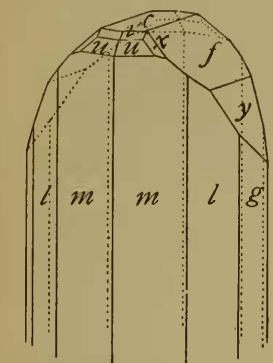


FIG. 5.—TOPAZ CRYSTAL FROM ILMEN MOUNTAINS.

metrical in appearance. The combinations are mostly simple. Of the prisms *m* and *l*, sometimes one, sometimes the other, predominates, and the same is true of the domes *f* and *y*. The macrodome *d* {201} is a characteristic form. The combination seen here (fig. 7) is that of a steep type of crystal very similar to the common type of Mexican crystals. It shows the two prisms, *m* and *l*, with *o* {221} and domes *d* {201} and *y* {041}, terminated by a small base, *c* {001}. (No. 81256, U.S.N.M.)

Fig. 8 is a square-shaped crystal with broad *l* faces, distinguished by a great development of the dome *f* and a long, narrow base. The brachypinacoid *b* {010} is also prominent. The

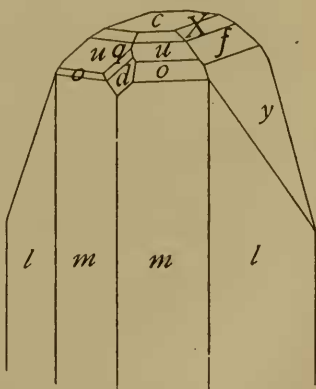


FIG. 6.—TOPAZ CRYSTAL FROM ILMEN MOUNTAINS.

prism m is deeply striated and the other forms are all narrow. (No. 82868, U.S.N.M.)

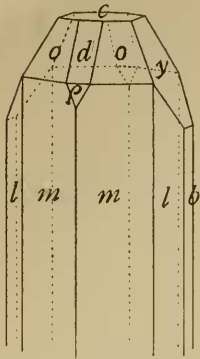


FIG. 7.—TOPAZ CRYSTAL FROM NERCHINSK.

SCHNECKENSTEIN.

This locality is represented by a good single crystal, about 1 cm. broad, and a few doubly terminated ones in the matrix. They have a pale yellow color.

Four different types of the Schneckenstein crystals have been described by Grünhut,¹ distinguished by the presence and size of certain forms, especially of the brachydome f {021}. The best crystal in the collection belongs to his first type, but is lacking in some of the rarer forms which he mentions. The type is quite similar to the Ilmen Mountain crystals.

Fig. 9 shows the most general combination. The prismatic zone is enriched by the presence of the two narrow prisms g {130} and M {230} and the pinacoid b {010}. The three

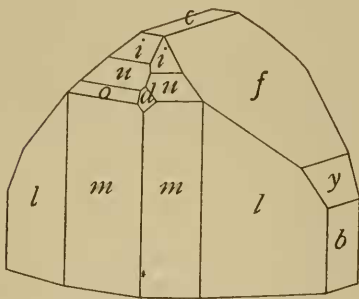


FIG. 8.—TOPAZ CRYSTAL FROM NERCHINSK.

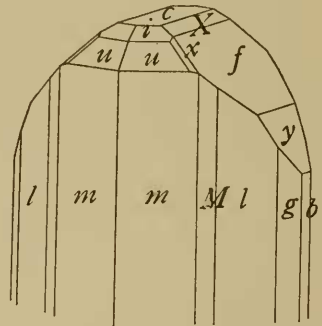


FIG. 9.—TOPAZ CRYSTAL FROM SCHNECKENSTEIN.

brachydomes y , f , and X are present, f predominating, and X very narrow. The prism faces are striated. (No. 82336, U.S.N.M.)

AUSTRALIA.

There is but one representative of this country in the collection. It is a colorless, about 1 cm. broad, crystal with somewhat rounded faces. In type and combination it is exactly similar to the Adun Chalon crystals.

JAPAN.

The collection contains a few colorless and more or less waterworn crystals from Takayama Mura. They are

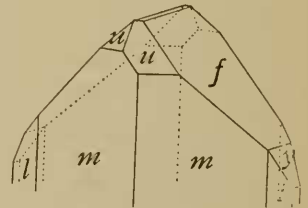


FIG. 10.—TOPAZ CRYSTAL FROM JAPAN.

¹Zeit. Kryst., 1884, IX, p. 124.

characterized by a broad development of the brachydome f and a narrow base and prominent u faces. Fig. 10 shows a common combination. (No. 47119, U.S.N.M.)

Besides these few crystals in the systematic mineral series there are a number of others kept intact in a set of Japanese minerals and rocks, which was presented by that Government to the Museum at the close of the Columbian Exposition. They come from the two localities, Otaniyama, Omi province, and Nakatsugawa, Mino province. The first-named locality is represented by two good crystals, one of them an exceptionally large square prism, measuring 5 cm. across its prismatic face. The combination is of l , c , m , and f . The prism m is narrow and f small in proportion to the size of crystal, while the broad base caps the prisms without any intervening pyramid faces. The smaller crystal has no base, making the f faces large in consequence. The macrodome d is also prominent.

The Mino province is represented by a lot of small crystals, all of which are characterized by a broad development of the domes f and d and little or no base. The other common forms, y , o , u , i , and b , are present.

BRAZIL.

The well-known Brazilian topaz crystals, although perhaps inferior to the Russian in size and beauty, seem to excel them

in the number of rare forms and combinations. The collection exhibits from the Villa Rica district a fine lot of wine-colored well-formed individuals, as well as several of the common deep-yellow, long prismatic ones.

Two general types are apparent. The first is characterized by long striated prismatic faces, capped usually by a low pyramid. The second has a steeper habit, due to the predominating pyramid o $\{221\}$ and dome y $\{041\}$ as terminations.

The crystals of this type are of the uniform wine color and have a richer and more perfect development of forms than those of the first type.

Fig. 11 shows one of the simplest combinations of the first type. It

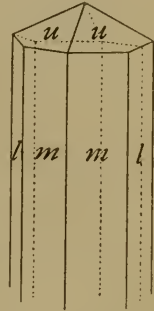


FIG. 11. — TOPAZ CRYSTAL FROM BRAZIL.

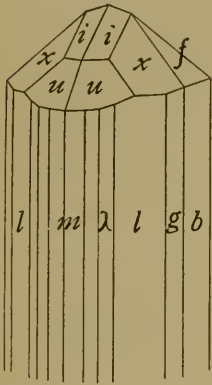


FIG. 12. — TOPAZ CRYSTAL FROM BRAZIL.

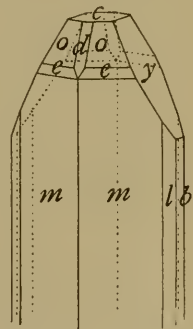


FIG. 13. — TOPAZ CRYSTAL FROM BRAZIL.

consists merely of the two prisms *m* and *l*, terminated by the low pyramid *u*. (No. 81259, U.S.N.M.)

Fig. 12 belongs to the same type, but has a much richer variety of forms. The prismatic zone includes several forms, among which *m* {110}, *Q* {450}, *λ* {470}, *l* {120}, *y* {130}, and *b* {010} were determined.

The terminating forms are *u* {111}, *i* {223}, *f* {021}, and *x* {243}. The faces of the brachypyr- amid *x* are as large as those of *u* and *f*.

The second type of crystal is shown in fig. 13. The faces of *o* and *y* are well developed and narrow faces of the steep pyramid *e* {441} are present. The *o* faces are completely devoid of luster, while those of *d* and *y* are bright.

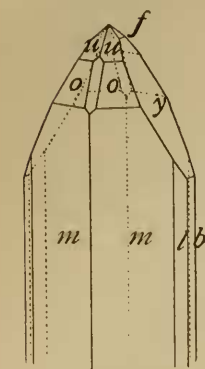


FIG. 14.—TOPAZ CRYSTAL FROM BRAZIL.

Fig. 14 is a fine clear crystal of the same type, having a small face of *f* and the pyramid *u*, but no base.

SAN LUIS POTOSI.

Several rose and colorless crystals are exhibited from this locality. They average about 1 cm. in breadth and have a steep pyramidal habit similar to the second type of the Brazilian crystals.

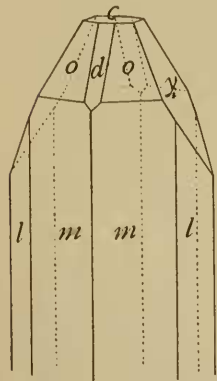


FIG. 16.—TOPAZ CRYSTAL FROM SAN LUIS POTOSI, MEXICO.

Of these the forms *e* and *f* are rare for these crystals. The brachypinacoid is, on the other hand, quite common. (No. 49248, U.S.N.M.)

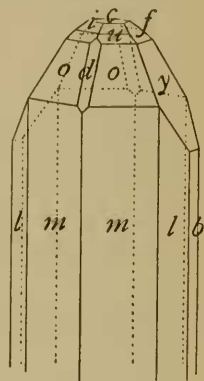


FIG. 15.—TOPAZ CRYSTAL FROM SAN LUIS POTOSI, MEXICO.

Grünhut¹ describes these crystals, citing several more forms than observed on these particular crystals. The natural etch figures occurring on these crystals are arranged perfectly symmetrical with respect to the three symmetry planes of the crystal, and while agreeing in the main with the shape of those described by Pelikan,² they do not show on the brachydome *y* the right and left unsymmetrical shape of figure which he reports for the etchings on the faces of this dome.

The most complete combination of forms is seen on the crystal shown in fig. 15. It has the pyramids *i*, *u*, and *o*, and also a very narrow *e*, with the domes *d*, *f*, and *y*, the whole truncated by a small

¹Zeit. Kryst., 1884, IX, p. 124.

²Tsch. min. u. petr. Mitth., 1890, XI, p. 331.

Fig. 16 is a simpler combination than the preceding, but is marked by the steep macrodome p $\{401\}$ not shown in the drawing. (No. 50037, U.S.N.M.)

ZACATECAS AND DURANGO.

The crystals from these two localities are so similar to those from San Luis Potosi that no separate description of them is necessary. On one of the Zacatecas crystals a face of the rare prism M $\{230\}$ occurs.

PIKES PEAK.

The collection embraces some fourteen crystals and pieces from this region. They range from 2 to 5 cm. wide and, unlike most of the crystals heretofore described, they show double terminations. They are colorless or of a faint bluish tint, and some are stained yellowish. All are of the same habit, and quite similar to the Ilmen mountain crystals. Cross and Hillebrand¹ reported the occurrence of topaz from this locality, citing the observed forms, two of which $\{445\}$ and $142\}$ appear questionable. Later Rev. R. T. Cross² mentions those found in the Platte mountains and gives the forms, all common, except $\{332\}$. These three forms mentioned do not occur on any of the crystals examined, but, on the other hand, there are seven forms present not mentioned in their descriptions.

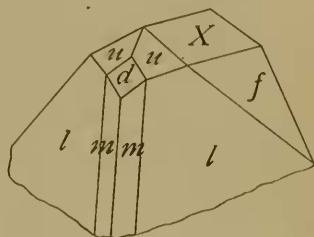


FIG. 17. TOPAZ CRYSTAL FROM PIKES PEAK, COLORADO.

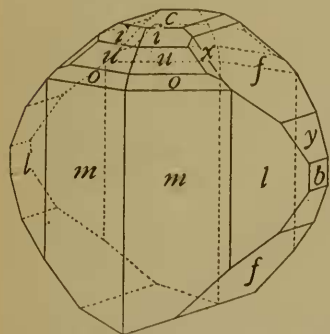


FIG. 18.—TOPAZ CRYSTAL FROM PIKES PEAK, COLORADO.

Fig. 17 is quite a characteristic combination for these crystals. No base is present, the two faces of X meeting in a long edge. The dome f is large, while y is small. The dome d is also common. (No. 82873, U.S.N.M.)

Fig. 18 shows a doubly terminated crystal with a richer variety of forms. The brachypyramid x and pinacoid b are rarer forms.

¹ Am. Jour. Sci., 3d ser., XXIV, p. 281.

² Idem, 3d ser., XXVI, p. 481.

The prism $g \{130\}$ and brachypyramid $J \{6.10.9\}$, besides the common forms, are shown on crystal (fig. 19). Another combination includes the narrow prism $M \{230\}$ between m and l .

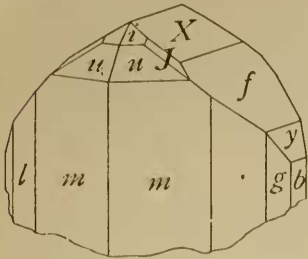


FIG. 19.—TOPAZ CRYSTAL FROM PIKES PEAK, COLORADO.

NATHROP, COLORADO.

Several small crystals are exhibited from this locality. They lie in the rhyolite matrix and are similar in type to the Mexican crystals. The observed forms are $m, l, b, o, d, y, f, u,$ and c . Cross¹ cites in addition the prism $g \{130\}$.

THOMAS RANGE, UTAH.

This locality is well represented by a large number of crystals from 1 to 5 mm. in width, some of them doubly terminated. A few have the original rich wine color, but most are colorless. They are very similar to the Mexican crystals in general habit.

In addition to the forms cited by Alling² there occur several quite rare ones, and on a few the extremely rare macropinacoid $a \{100\}$ is well developed both front and rear.



FIG. 21.—TOPAZ CRYSTAL FROM UTAH.

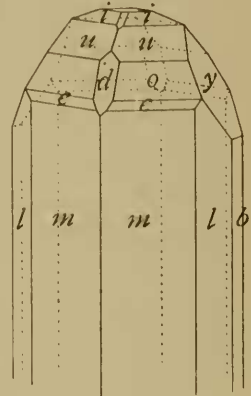


FIG. 20.—TOPAZ CRYSTAL FROM UTAH.

The forms observed in addition to those previously given are $a \{100\}, M \{230\}, g \{130\}, X \{023\}, x \{243\}, h \{203\},$ and $\rho \{401\}$. Of these x and h occur on but one crystal, and are extremely narrow. The prism g is not infrequent, while on the other hand the prism $u \{140\}$, figured by G. Stanley Brown,³ does not occur on any of the crystals. Many of the crystals show oscillations in their growth, causing reentrant angles or striated planes instead of sharp edges of intersection between planes. The edges

$uy, oy,$ and ly thus appear as if replaced by planes, but measurements show them to have no constant angles with the adjacent faces.

Fig. 20 shows a general combination. It has, besides the common forms, the rarer ones $c, b,$ and h . (No. 45191, U.S.N.M.)

The most general combination of all is seen in fig. 21, having as narrow forms $a, M, g, c, p, x,$ and X .

¹ Am. Jour. Sci., 3d ser., XXXI, p. 432.

² Am. Jour. Sci., 3d ser., XXXIII, p. 116.

³ Dana's System of Mineralogy, p. 193.

CHATHAM, NEW HAMPSHIRE.

Two good crystals from Bald Face Mountain, near Stoneham, Maine, are shown in the collection. They are about 2 cm. in width and perfectly colorless, with bright faces. In habit and combinations they are similar to the Pikes Peak crystals. The base is not present on either of the crystals, and X therefore meets in a long edge.

Fig. 22 shows the type of crystal. The three brachydomes X , f , and y are all well developed. The edge uX is replaced by a plane which is so rounded as to be indeterminate, but from its position corresponds to the form $J \{6.10.9\}$ occurring on the Pikes Peak crystal. (No. 82579, U.S.N.M.)

In conclusion, the writer wishes to express his acknowledgments to Mr. Wirt Tassin, the assistant curator in the department of minerals, for his kindness in permitting the free use of material and instruments for this study.

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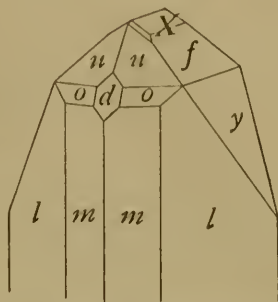


FIG. 22.—TOPAZ CRYSTAL FROM BALD FACE MOUNTAIN, NEW HAMPSHIRE.